APPENDIX M

COMMENTS AND DOE RESPONSES ON DRAFT ENVIRONMENTAL IMPACT STATEMENT L-REACTOR OPERATION

During the 45-day public comment period from October 1 through November 14, 1983, the U.S. Department of Energy (DOE) received 140 comment letters and statements on the draft version of this environmental impact statement (EIS). In addition, four comment letters were received after November 14, 1983. Of the total of 144 letters and statements, 7 were from Federal agencies and 7 were from agencies and offices of the States of Georgia and South Carolina. Forty-eight statements were presented at public meetings conducted by DOE at Augusta and Savannah, Georgia, and at Aiken and Beaufort, South Carolina, during the week of October 31, 1983. DOE has prepared a public comment/hearing report (DOE /SR - 5009) that includes transcripts of these public meetings, written statements received at the meetings, and all comment letters received by DOE through the mail. This report has been placed in the DOE public documents rooms in Washington, D.C., and Aiken, South Carolina, and 19 local libraries in South Carolina and Georgia.

This appendix presents the individual comment letters and statements and DOE's responses to them. If a comment or statement has led to a revision to the text of this EIS, the revision is identified by a vertical line in the margin and a comment letter-number designation. Table M-1 lists the comments received, and Table M-2 lists the individual comments and DOE responses.

The comments and statements reflected a number of specific and general issues. The following synopsis summarizes the major issues listed in alphabetical order and DOE's responses.

COOLING-WATER ALTERNATIVES

Comments

One of the most commented-on aspects of the Draft EIS concerned the discussion of cooling-water alternatives, and in particular the Department of Energy's identification of restarting L-Reactor with direct discharge and subsequent mitigation as its preferred alternative. Major categories of comments included:

- Cooling-water alternatives were not seriously considered.
- Mitigation of L-Reactor thermal discharge should be taken prior to L-Reactor restart.
- Direct discharge of cooling-water would violate the State of South Carolina's water quality standards.
- Several of the cooling-water alternatives to direct discharge would also violate state water quality standards.

- The Draft EIS failed to identify the specific cooling-water mitigation measures that would be taken.

- Recirculating cooling-towers are environmentally preferable.

In general, almost all of the comments received on the subject of cooling-water alternatives expressed a desire to see the Department of Energy implement a cooling-water alternative prior to the restart of L-Reactor that would meet the State of South Carolina's water quality standards.

Federal and state agencies commenting on the Draft EIS's discussion of cooling-water alternatives included the U.S. Environmental Protection Agency, the U.S. Department of the Interior, the South Carolina Department of Health and Environmental Control, the South Carolina Water Resources Commission, and the South Carolina Wildlife and Marine Resources Division. These agencies indicated that the restart of L-Reactor with direct discharge would violate existing Federal and state water quality regulations, would reverse the successional recovery of the Steel Creek ecosystem, would result in unsatisfactory and significant effects on ecological resources, and the impacts of direct discharge could be alleviated through the implementation of alternative cooling-water systems. The Environmental Protection Agency rated the Draft EIS as being environmentally unsatisfactory ". . . on the basis of outstanding water quality issues." The Environmental Protection Agency further stated that the Draft EIS ". . . does not not provide sufficient information regarding the corrective measures that will be employed to avoid adverse environmental impacts." The U.S. Department of the Interior stated: "If DOE neither selects mechanical draft cooling towers nor develops a plan to adequately mitigate for impacts to fish and wildlife resources, then the Department of the Interior may choose to refer this project to the Council on Environmental Quality pursuant to 40 CFR 1504."

Response

Based on the Department of Energy's review and evaluation of the comments received, several modifications to the Draft EIS's discussion of cooling alternatives and the Department's preferred alternative have been made in this Final EIS.

Section 4.4.2 of this Final EIS has been modified to provide a detailed discussion of additional combinations of various cooling-water systems. Specifically, Section 4.4.2 now provides an evaluation of thirty-three cooling-water systems, including a discussion of each system's capability to attain the water quality standards of the State of South Carolina. Appendix I of this Final EIS has also been modified to evaluate the potential wetland losses associated with each of cooling-water systems discussed in the revised Section 4.4.2.

The cooling-water systems considered in Section 4.4.2 can be grouped into five major categories--once through cooling lake, recirculating cooling lake, once-through cooling tower, recirculating cooling tower, and direct discharge. Based on this categorization, a new section (Section 4.4.2.6) has been added to this Final EIS that summarizes and compares the engineering and environmental evaluations for the most favorable alternatives for each of these categories of cooling-water systems. The criteria used in selecting the most favorable alternative for each of the categories considered included: ability to meet

South Carolina water quality standards, production considerations, schedule, environmental factors, and cost. The ability to expedite the schedule of implementing the alternatives was also considered as well as the degree that reactor operation would have to be modified to attain water quality standards.

After considering all factors, the Department has identified a once-through 1000-acre lake prior to the restart of L-Reactor as its preferred cooling-water alternative. Although cooling towers would cause fewer environmental impacts, the once-through 1000-acre lake was identified as the preferred system because it would:

- Meet all State and Federal regulatory and environmental requirements, eliminating thermal impacts on the river, swamp, and unimpounded stream while providing a productive balanced biological community in the lake.

- Provide the earliest reactor startup and the maximum plutonium deliveries of any environmentally acceptable cooling-water system that can meet regulatory requirements.

- Have the lowest costs of any environmentally acceptable cooling-water system that can meet regulatory requirements.

- Be amenable to backfitting with precooler systems, if needed, which could improve reactor operational flexibility and production capability.

Based on the identification of implementing a 1000-acre lake prior to L-Reactor restart as the preferred cooling-water system, the Department has modified Section 2.4 of this Final EIS to provide a summary comparison of the most favorable cooling-water system alternatives and a summary comparison of the impacts of the preferred alternative--to restart L-Reactor as soon as practiable after the construction of the 1000-acre lake--and the no-action alternative. Also, the Department has added a new section and appendix--Section 4.5 and Appendix L--to this Final EIS to specifically discuss the environmental consequences of the preferred alternative.

EMERGENCY PLANNING

Comments

Emergency planning comments received during the Draft EIS review period tended to be general in nature, focusing on the ability or inability of local emergency response capability. A few of the more specific comments included:

- The adequacy of a 50-mile ingestion pathway Emergency Planning Zone (EPZ) was questioned.

- There has been a lack of emergency planning by counties surrounding the SRP.

- Accidents used for emergency planning might not be severe enough.

DOE responses

DOE has expanded the EIS, in Appendix H, to include areas served by water systems in Beaufort and Jasper Counties and the Port Wentworth and Savannah areas for the ingestion pathway. These areas will be included in planning for responses to releases of radionuclides that could enter the food or water ingestion pathway to humans.

DOE has signed formal memoranda of understanding (MOUs) with the States of South Carolina and Georgia to provide staff assistance in the preparation of offsite emergency plans for SRP incidents. This planning includes state and county-level responses, training, public education, and coordination activities. The MOUs include agreements with hospitals to accept contaminated patients and processes and procedures for the distribution of information and the notification of responsible agencies and the public. DOE will conduct exercises of these plans to assure appropriate actions and coordination of responses. Separate plans are in place to respond to terrorist attacks or military acts onsite. If such an act resulted in a release of radioactive material offsite, the state and county plans for SRP emergencies would be implemented and other Federal agency support would be activated.

DOE has applied the planning basis and emergency operating procedures for SRP accidents to areas outside the EPZ but within 10 miles of the reactors (the Contingency Planning Zone); they can be extended to more distant areas if necessary.

ENDANGERED SPECIES AND WILDLIFE

Comments

A number of general and specific concerns regarding the L-Reactor restart impacts on endangered species and their habitats were raised during the review of the Draft EIS. Most of these concerns dealt with the impacts from the direct discharge of cooling water to Steel Creek. Specific questions and concerns were raised with respect to the wood stork. Other general categories of comments and concerns included:

- Results of consultations with the U.S. Fish and Wildlife Service and the National Marine Fisheries Service regarding potential impacts on and mitigation measures for endangered species should be presented.

- Radioactive substances released to the environment are incorporated and frequently concentrated in tissues of many organisms. The effects of this radiation are not addressed adequately.

- The effects of chemicals discharged into creeks on the SRP and the Savannah River might be harmful to fishes and wildlife.

DOE responses

In this Final EIS, the Department of Energy has identified its preferred cooling-water alternative as the construction of a 1000-acre lake before

L-Reactor resumes operation, to redesign the reactor outfall, and to operate L-Reactor in a way that assures a balanced biological community in about 50 percent of the lake.

On February 25, 1983, the FWS issued a Biological Opinion on the American alligator (Alligator mississippiensis), which stated that the operation of L-Reactor as proposed (direct discharge of cooling water) would not jeopardize the continued existence of this species. Since the issuance of this opinion, the Department of Energy has identified the discharge of cooling water to a 1000-acre cooling lake as its preferred cooling-water system for L-Reactor. An updated biological assessment that includes the Department's preferred cooling-water system was transmitted to the FWS at the end of March 1984. Currently, the Department is awaiting the review of this updated assessment by the FWS. The Department anticipates that the FWS review will not alter the prior opinion that the operation of L-Reactor would not jeopardize the continued existence of this species.

Listing of the wood stork (Mycteria americana) as an endangered species occurred February 28, 1984, after the Draft EIS for L-Reactor was completed. Beginning in April 1983, studies on the wood stork were initiated. The design of the wood stork study program and preliminary results of the program were provided to the FWS during an informal consultation process. Data from the wood stork program has been included in this Final EIS. A biological assessment for the wood stork was formally transmitted to the FWS at the end of March 1984. The Department is currently awaiting the review of this assessment by the FWS. The Department anticipates that as a result of the FWS review, the FWS will concur in the Department's conclusion that while the operation of L-Reactor might affect portions of the wood stork's SRP foraging habitat, operation of L-Reactor and other ongoing and planned operations will not affect the continued existence of this species.

A Biological Assessment of the impacts of present and proposed operations at the Savannah River Plant (SRP) on the shortnose sturgeon (Acipenser brevirostrum) was provided to the National Marine Fisheries Service (NMFS) in 1983. Following review of the assessment, NMFS issued on November 1, 1983, their Biological Opinion that the population of the shortnose sturgeon in the Savannah River would not be adversely affected by ongoing and planned actions at SRP (including operation of L-Reactor).

Information was provided to the U.S. Fish and Wildlife Service (FWS) in 1982 regarding potential impacts to the red-cockaded woodpecker (Picoides borealis) from the restart and operation of L-Reactor. FWS reviewed the information and provided its Biological Opinion on February 25, 1983, that the proposed restart and operation of L-Reactor would not affect this species.

The Department of Energy is working with the Fish and Wildlife Service to develop a Habitat Evaluation Procedure (HEP) plan for the Steel Creek system with the implementation of the preferred thermal mitigation system for L-Reactor. The HEP will identify the value of habitat to be gained or lost with implementation of the preferred L-Reactor cooling-water alternative for use in assessing further mitigation. If required, the Department of Energy will implement additional mitigative measures that might be identified through the HEP process dependent on Congressional authorization and appropriation.

The dispersion, uptake, and concentration of radioactivity in the environment has been studied for several decades. Based on these studies, predictive methodologies are well established; these methodologies were used to predict the potential environmental consequences of the L-Reactor restart. Similarly, the effects of radiation exposure on many species of fishes, birds, and animals have been studied; the general conclusions are that biota other than man are less sensitive to radiation. The low concentrations of radioactive materials around the SRP are not expected to cause any measurable or observable effects in wildlife.

DOE monitors chemical discharges from the Plant. Results of the extensive SRP monitoring program are published annually and are available to the public. Liquid releases are governed by a permit issued by the State of South Carolina under the National Pollutant Discharge Elimination System; these releases are considered acceptable in relation to their potential effects on water quality and wildlife that use the waterways. This permit and the discharges made under it are monitored by DOE and the State of South Carolina. No effects on marine life in the Savannah River estuary or the Atlantic Ocean have been detected.

GROUND WATER

Comments

One of the most commented-on aspects of the Draft EIS concerned the discussion of potential ground-water impacts. Comments ranged from very broad statements that the restart of L-Reactor would increase ground-water contamination by 33 percent to several very specific comments on ground-water data, analysis methodology, and geohydrologic assumptions. Comments from state and Federal agencies also indicated a concern with respect to jurisdictional responsibilities under the Resource Conservation and Recovery Act (RCRA) and the relationship of proposed clean-up programs to any further contamination due to the restart of L-Reactor. In general, the majority of comments received reflected a concern that the restart of L-Reactor should not increase any existing levels of ground-water contamination. A few of the more specific categories of comments included:

- The protection afforded the Tuscaloosa Aquifer by the upward differential between the Tuscaloosa Formation and the overlying Congaree Formation was assessed inadequately.

- Ground-water withdrawal from the Tuscaloosa Formation in support of L-Reactor operation will affect the water levels in offsite wells.

- The Draft EIS is flawed by the lack of hydrogeological data for the immediate vicinity of L-Reactor and by its reliance, without proper justification, on data for the F- and H-Areas, which are about 10 kilometers away.

- Existing ground-water contamination and cleanup at support facilities for L-Reactor operation were not addressed adquately.

- Results of state-of-the-art mathematical modeling of wastewater flow from seepage basins, including mass balance calculations, should be presented in the Final EIS.

DOE response

The EIS discusses the expected total SRP ground-water withdrawal from the Tuscaloosa Aquifer, including increased pumping to support the operation of L-Reactor and its support facilities. This ground-water usage is about 75 percent of the lower bound estimate of the ground-water flux through the Tuscaloosa calculated in 1974. This usage is not expected to have appreciable effects on water levels in onsite wells. Finally, the EIS shows that the total withdrawal of ground water from the Tuscaloosa, including the withdrawal by L-Reactor and its support facilities, the Fuel Materials Facility, and the Defense Waste Processing Facility, will be about 75 percent of the flux through the Tuscaloosa on and near the SRP.

The head differences between the upper Tuscaloosa Formation and the Congaree Formation (Appendix F) were developed from measurements of the water levels made in monitoring wells, not in production wells. These water measurements were made when the production wells were in operation; thus, the calculated head differences have not been altered. A decline in the upper head differential of about 0.16 meters per year appears to be primarily related to pumping at SRP; however, part of this decline appears to be related to recent drought conditions. Because pumping rates are expected to be relatively stable in the future, this rate of decline is not expected to continue. This EIS separates the data on an aquifer basis to provide a better understanding of the hydrogeology.

Sections in this EIS dealing with M-Area ground-water contamination have been updated to reflect the latest ground-water and analysis data. These sections indicate that the entry of chlorinated hydrocarbons into the Tuscaloosa Aquifer occurred through migration in the Tertiary ground-water system through the defective cement grout of at least one production well. The implementation of the M-Area remedial action program will retard further migration of chlorinated hydrocarbons in the Tertiary ground-water system. Furthermore, DOE will discontinue the use of the M-Area basin by April 1985.

The monitoring of on-site and offsite wells has shown that contaminants have not migrated offsite and that no offsite health risk will exist in the foreseeable future. DOE is determining the effectiveness of a pilot stripper in the removal of chlorinated hydrocarbons from the Tertiary system beneath A- and M-Areas. State and Federal agencies have reviewed the remedial action program of removing the contaminants by the use of a combination of recovery wells and a large production air stripper. This system is expected to be operational by August 1984.

Discharges to the L-Area seepage basin and the incremental increases in discharges to the F- and H-Area seepage basins will impact shallow ground water beneath the basins. The hydrostratigraphic units beneath these seepage basins help protect the Ellenton and Tuscaloosa Aquifers. Waste streams released to the L-Reactor seepage basin are expected to discharge eventually to Steel Creek. Releases to F- and H-Area seepage basins will discharge to low-lying areas along Four Mile Creek. Radionuclide concentrations, when discharged from

these creeks to the Savannah River, will be within DOE guidelines for releases to uncontrolled areas.

The EIS discusses alternatives to the use of the L-Reactor seepage basin. Based on Congressional authorization and approval of a fiscal year 1984 funding request, DOE plans to operate an effluent treatment facility by October 1988 to process wastewater being discharged to the F- and H-Area seepage basins.

The State of South Carolina and the Environmental Protection Agency have reviewed a draft of the "SRP Groundwater Protection Implementation Plan." The plan is being finalized based on the review comments. This plan examines strategies and schedules for implementing ground-water mitigative actions, including the closing and decommissioning of seepage basins. As noted in the EIS, this plan will meet the requirements of DOE Order 5480.2, EPA regulations 40 CFR 260.25, and SCDHEC requirements. The decision on this plan will be the subject of a separate NEPA review.

The Department of Energy is committed to several items related to ground-water monitoring and mitigation at SRP, including (1) continuing and expanding the program of ground-water monitoring and studies; (2) involving the State of South Carolina in onsite and near-site ground-water monitoring activities; and (3) taking mitigation actions to reduce pollutants released to the ground water and establishing a mutually agreed-on compliance schedule for mitigation efforts.

NEED FOR MATERIAL AND PRODUCTION ALTERNATIVES

Comments

During the public review/comment period on the Draft EIS, several comments were submitted on the need for additional defense nuclear materials and several other accelerated production initiatives were suggested as alternatives to the restart of L-Reactor. The types of comments most frequently cited included:

- There was not sufficient information presented in Chapter 1 to provide a basis for supporting the definitive need to restart the L-Reactor in January 1984.
- Retired warhead material should be recycled.
- Because DOE has exceeded production goals for plutonium and there have been decreases in the numbers of new warhead deployments, the need for plutonium has been reduced.
- The early restart of the PUREX Plant will supply plutonium, thereby eliminating the need to restart the L-Reactor immediately.
- The Draft EIS did not consider production alternatives (Chapter 2) in sufficient detail.

DOE responses

The discussion on the need for L-Reactor and production alternatives in Chapters 1 and 2 is, by necessity, qualitative and limited because quantitative information on defense material requirements, inventories, production capacity, and projected material shortages or adverse impacts on weapon system deployment is classified. A quantitative discussion of the need for restarting L-Reactor and of production alternatives is provided for the DOE decisionmaker in a classified appendix (Appendix A) to this EIS.

The development of each annual Nuclear Weapons Stockpile Memorandum (NWSM) is based on detailed analyses of scheduled and planned new weapon systems, scheduled and planned weapon retirements, the current status of legislative actions concerning weapon systems and production capability, the current status of material inventory, material supply from weapon retirements, and material production and weapons fabrication. Each NWSM contains the results of analyses of these factors based on the information available at the time it is developed; therefore, changes in the status and plans for production and deployment of weapons are fully accounted for from one NWSM to the next. The analysis in the classified Appendix A of this EIS uses data consistent with the status of legislative actions and administration plans concerning weapon systems and material production at the time of development of the FY 1984-1989 NWSM, which was approved by President Reagan on February 16, 1984. If significant changes occur after the development of an NWSM, such as Congressional action potentially impacting material supply/demand, DOE factors the impact into the implementation of the NWSM requirements after the Department of Defense formalizes the modified requirements.

Originally, the PUREX Plant on the DOE Hanford Reservation was to resume operation by April 1984; however, the plant started operation 5 months ahead of schedule. The PUREX Plant does not produce plutonium; it separates reactor-produced plutonium from uranium and waste products. Its early restart will have very little effect on the supply of weapons-grade plutonium in the timeframe of concern for L-Reactor because sufficient supplies of fuel-grade plutonium are already available in inventory for blending and the capacity of the PUREX Plant is large in comparison with the backlog of fuel-grade material from N-Reactor available for processing. Furthermore, the early plant startup was factored into the material supply information in the FY 1984-1989 NWSM that was approved recently by President Reagan and was used as a basis for the need for L-Reactor in this final EIS.

In evaluating the need for defense nuclear materials and for restarting L-Reactor, DOE analyzed a delayed restart in Appendix A (classified). The implementation of the potential partial-production options discussed in Chapter 2 was also analyzed as a way to offset production losses associated with such a delay. The results of these analyses concluded that partial production alternatives, individually or in combination, would provide only a small fraction of the required defense nuclear materials that could be produced by L-Reactor.

DOE also analyzed all full-production options that would provide as much plutonium as the proposed restart of L-Reactor. This analysis considered existing production reactors as well as the potential use of spent commercial fuel. However, the conversion of spent commercial reactor fuel into weapons-grade plutonium is prohibited by law; legislative removal of this prohibition is

unlikely in the near future. The restart of other inactive DOE production reactors was also dismissed as unreasonable due to the time that would be required to restore these reactors for plutonium production.

RADIOACTIVE RELEASES

Comments

During the Draft EIS review period, comments were also raised regarding potential radioactive releases. Many of the comments reflected a general concern for potential radioactive contamination or an opinion that no level of radiation was safe. Many commentors also were concerned with the comparability of L-Reactor radiological releases to those of a commercial nuclear power reactor. Other categories of comments included:

- Prior reports on SRP accidents and routine releases should be used as sources for estimated radioactive releases.
- Measures should be taken to prevent the remobilization of radiocesium.
- Release data are not readily available to the public.
- The EIS should present the cumulative impacts of nuclear facilities in the Savannah River Basin.

DOE responses

The estimates of radioactive releases to the environment resulting from L-Reactor startup are based not only on design information but also on the experience and measurement of releases for more than 25 years of operation of the Savannah River Plant. Routine releases from the proposed operation of L-Reactor and the increased releases from associated facilities that will support L-Reactor operation, such as the separations facility, were included. The releases for L-Reactor were based on the average measured releases of the operating C-, K-, and P-Reactors from 1978 through 1980. The analysis of routine and incremental radioactive releases do not include releases from SRP facilities that are not associated with L-Reactor operation; however, the nonassociated releases and the releases from other planned SRP facilities are analyzed in the discussion of cumulative releases.

The radioactive releases from L-Reactor and its support facilities to the aqueous environment result in concentrations in drinking water (e.g., in Beaufort/Jasper and Port Wentworth) that are very small fractions of the EPA drinking-water standard value. Estimates of atmospheric releases from L-Reactor and its support facilities result in small incremental increases in ambient atmospheric concentrations that are within all applicable state and Federal guidelines. The restart of L-Reactor will be in compliance with the DOE radiation protection standards that are comparable to those of the Nuclear Regulatory Commission (10 CFR 20) for a production facility (i.e., 500 millirem to the whole body in one calendar year).

The remobilization and transport of radiocesium and radiocobalt from Steel Creek sediments caused by the direct discharge of L-Reactor cooling water have been studied and assessed in detail. The resulting concentrations in the Savannah River will be very small. The concentrations from these releases in potable water from the Beaufort-Jasper and Cherokee Hill water-treatment plants were calculated to less than 1/2200th (for radiocesium) and less than 1/4160th (for radiocobalt) of the EPA drinking-water standard values. Radiocesium and radiocobalt releases for the Department's preferred cooling-water alternative (1000-acre lake) are estimated to be no greater than those from the direct discharge of cooling water.

DOE measures concentrations of radioactivity in air, water, and soil in the region due to releases from SRP as part of its annual environmental monitoring program. These concentrations, along with the doses to the maximally exposed individual and the general population offsite, are reported to the public in annual SRP environmental monitoring reports. The resulting doses are well within established limits and represent a very small fraction of background radiation doses. No detrimental effects due to SRP radioactive releases have been observed, and analyses indicate that none should be expected. Expanded monitoring, to assess the displacement of radioactive isotopes in Steel Creek and in the Savannah River swamp will be included in future issues of the SRP environmental monitoring report.

Abnormal release information is also reported. Tritium releases and their consequences have been well documented in Environmental Effects of a Tritium Gas Release from the Savannah River Plant on May 2, 1974 (DP-1369), Environmental Effects of a Tritium Gas Release from the Savannah River Plant on December 31, 1975 (DP-1415), and the publicly available 1975 annual report, Environmental Monitoring in the Vicinity of the Savannah River Plant (DPSPU-76-30-1). Abnormal releases are documented in the annual environmental monitoring reports.

The EIS presents and discusses the cumulative radiological effects of all nuclear facilities expected to be operating within an 80-kilometer radius of L-Reactor. Specifically, the EIS considers the potential cumulative radiological releases from all existing and planned SRP operations, the Alvin W. Vogtle Nuclear Power Plant (under construction), the Barnwell Nuclear Fuel Plant (not expected to operate), and the Chem-Nuclear Services, Inc., low-level radioactive disposal site.

RADIOLOGICAL EFFECTS

Comments

In addition to the comments concerning radioactive releases, other comments were received during the Draft EIS review period on the effects of those releases. Major categories of comments on radiological effects included:

- Effects of cumulative low-level exposure are not addressed adequately.
- Method of estimating doses is not presented adequately.

- Bases of estimates of effects (e.g., radiation-induced cancer) are not presented adequately.

- Detrimental effects of radioactive releases on workers and people in the area over the past 25 years are not considered adequately.

DOE responses

Using the radioactive release information discussed in the previous section, standard dosimetry models were used to calculate radiological doses. The dose models are based on recommendation of the International Commission on Radiological Protection. Appendix B of the EIS discusses the methodologies used in calculating the radiological doses and resultant estimates of health effects.

The operation of L-Reactor and its associated support facilities will increase the dose to the population within an 80-kilometer radius and to downstream users of Savannah River water by an amount equivalent to about 0.05 percent of the natural background radiation. The incidents of effects of such exposures are considerably below measurable levels.

The BEIR III report (The Effects on Populations of Exposures to Low Levels of Ionizing Radiation), published by the National Academy of Sciences in 1980, was used as a basis for establishing a relationship between radiological doses calculated in the EIS and any resulting health effects in terms of excess cancer fatalities. Estimates of radiation health effects in this report are based on the observed incidence of cancer-induced fatalities that resulted from exposures to high radiation levels. This data base included information derived from studies of survivors of the atomic bombs dropped on Nagasaki and Hiroshima, and from medical procedures that result in high radiation doses. The basic problem addressed in the BEIR III report was how to extrapolate from health effects observed at high levels of radiation to estimates of health effects that might be associated with very low levels of radiation, such as those resulting from L-Reactor operation. In this sense, the BEIR III report is largely a statistical study of empirical data, rather than a theoretical report.

The BEIR III report was selected for use in the EIS in preference to evidence directly related to SRP because no observable health effects resulting from SRP operations, in terms of excess cancer fatalities, can be quantified or identified.

Exposures of SRP workers to internal and external radiation are carefully monitored and controlled through a health physics program designed to maintain occupational doses "as low as reasonably achievable" (ALARA), as outlined in Environmental Protection, Safety, and Health Protection for DOE Operations, DOE 5484.1a.1, (1981). Occupational doses at SRP to date have been well below DOE limits of 5 rem per year. Furthermore, occupational doses associated with reactor operations have decreased from an average of 200 person-rem per reactor-year during the period from 1960 through 1968 to an average of 69 person-rem per reactor-year during the period from 1976 through 1980, as a result of the ALARA operating philosophy.

Of the 411 production workers who (through October 1983) have shown positive evidence of assimilation of transuranic elements, including plutonium, only 6 have exceeded 50 percent of a Maximum Permissible Body Burden (MPBB), as

defined by the International Commission on Radiological Protection ("Report of ICRP Committee II on Permissible Dose for Internal Radiation," Health Physics, Volume 3, 1960). The maximum individual assimilation was 90 percent of MPBB. During the entire operation of the Savannah River Plant, only one worker has exceeded the occupational exposure limit of 5 rem per year. No biological effects are expected from exposures of this magnitude. An ongoing health study of SRP workers has shown no evidence of unusual health effects that could be attributed to radiation exposure.

A series of health effects studies of the population around the Savannah River Plant has been made by Professor H. J. Sauer, who was originally with the University of Missouri and is now an independent contractor. Epidemiological studies of the SRP workers are being made by Oak Ridge Associated Universities and the Los Alamos National Laboratory. The Centers for Disease Control has also made some studies of the occurrence of a rare blood disease, Polycythemia Vera, in response to newspaper reports, since retracted, that this disease was unusually prevalent in the vicinity of SRP. Further, the Centers for Disease Control, in response to requests from DOE, has formed an independent panel to determine the need for any additional studies that might be desirable. These past and ongoing studies will ensure that reasonable efforts continue with regard to health effects from SRP operations, even though these effects are predicted to be too small to be statistically detectable.

SAFETY ANALYSIS

Comments

Comments on the accident analyses and safety system sections of the Draft EIS included:

- Need for a containment building.
- Comparability of L-Reactor to the NRC's requirements for nuclear reactor site criteria.
- Presentation of a "worst-case" analysis.

For the most part, the comments on the need for a containment building were general, often only citing that commercial reactors are required to have them and L-Reactor is not. Other comments on the need for a containment building concerned the comparability of the accident analyses for L-Reactor to the Nuclear Regulatory Commission's requirements for reactor site criteria (10 CFR 100). Specifically, commentors contended that a postualted 100-percent core-melt accident was the proper basis for assessing the safety comparability of L-Reactor to commercial reactors. They also contended that if the 100-percent core-melt accident were used as the basis, the L-Reactor would not meet the Nuclear Regulatory Commission's site evaluations factors for commercial reactors.

Finally, others contended that the Draft EIS failed to present a worst-case analysis. Specifically, commentors asserted that the EIS, rather than presenting the consequences of a 10-percent postulated core-melt accident, should present the consequences of a 100-percent core-melt accident concurrent with a failure of the confinement system.

DOE responses

The need for containment buildings for commercial reactors is based on their design, site characteristics, and the need for specific engineered safety features to limit radioactive releases in the event of an accident. Reactors of different designs and engineered safety features other than a containment building can also limit radioactive releases to be within acceptable standards for a range of postulated accidents. The Fort St. Vrain reactor, which has been licensed by the Nuclear Regulatory Commission, is an example of a commerical reactor without a containment building; it has a different design and alternative engineered safety features from commercial light-water reactors.

The L-Reactor has several important design features and alternative engineered safety features that must be considered in any comparison with light-water commercial reactors. For example, L-Reactor operates at much lower pressures and lower temperatures than commercial light-water reactors; thus, the stored energy in a postulated loss-of-coolant accident--which is of primary concern in the need for a containment building--is much less. Other important differences exist for operational limits, emergency shutdown systems, the confinement system, the type of fuel, and the distance to the nearest site boundary. These differences, when taken into account in the analysis of credible accident events and resultant consequences, indicate that L-Reactor with its confinement system would meet the Nuclear Regulatory Commission's site evaluation factors.

The regulations in 10 CFR 100 do not assume or require the assumption of "a full-core meltdown." Rather, the footnote to 10 CFR 100.11(a) clearly indicates accidental events, that would result in potential hazards not exceeded by those from any accident considered credible. Such accidents have generally been assumed to result in substantial meltdown of the core with subsequent release of appreciable quantities of fission products. "Full-core meltdown" is not equal to "substantial meltdown;" the 10 CFR 100 reference to TID-14844 particularly notes that: "The calculations described [in TID-14844] may be used as a point of departure for consideration of particular site requirements which may result from evaluation of the characteristics of a particular reactor, its purpose and method of operation. Thus, the source-term assumption cited is not mandated for use, either in 10 CFR 100 or in TID-14844.

The NRC licensing of the Fort St. Vrain reactor is an example of a reactor licensed with recognition of the differences between its design and the design of light-water reactors (LWRs). This reactor does not have a containment building, but has alternative safety features that the NRC considers to be adequate. Recognizing the high heat capacity of this graphite-moderated reactor, no fuel melting was assumed when specifying the source term for use with 10 CFR 100. Release of gases as a result of core heatup (not melting) was assumed over a period of hours, not instantaneously as is commonly assumed for LWRs. Furthermore, release of only 5.5 percent of the halogens in the reactor core was assumed, rather than the 50 percent commonly assumed for LWRs.

The Department of Energy recognizes uncertainties inherent in the predictions and likelihood of extremely low probability but high-consequence accidents. The worst-case analysis required by NEPA is intended to provide the decisionmaker with information to balance the need for the action against the risk of possible adverse impacts if the action were to proceed in the face of uncertainty. The "uncertainty" in this instance, however, does not question the severity of the consequences if this class of accident were to occur, but rather the degree of improbability of its occurrence (i.e., whether once in 10 million years or once in a billion or more years). The detailed analyses of the very-low-probability, 10-percent, core-melt accident, together with available preliminary information on the consequences and probabilities of a spectrum of more severe but even less probable accidents included in the EIS are judged to provide the decisionmaker with sufficient information for this purpose.